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USDA ■ Forest Service

## forest insect & disease management methods application group

2810 Chiles Rd. ■ Davis, Ca. 95616

September 1978 (7)

### NEWSLETTER

#### TUSSOCK MOTH MODEL WORKSHOP HELD

FI&DM/MAG and the USDA Expanded Douglas-fir Tussock Moth Research and Development Program once again joined forces, this time to cosponsor a workshop on the Douglas-fir Tussock Moth Stand Outbreak Model. The workshop was held in Fort Collins, Colorado, July 18-20.

The workshop objective was to provide users of the stand outbreak model, one of three components of the Douglas-fir tussock moth pest management model, with an understanding of the model--how it works, and what it is capable of doing. The workshop also gave the participants actual experience in running the model through computer terminals at the Fort Collins Computer Center.

The program was arranged by Jim Colbert of Oregon State University and John Wong of FI&DM/MAG. Jim and John reviewed initial model output, data preparation, and computer runstream procedures. The agenda also included presentations by representatives from both research and FI&DM on system interactions and potential uses of the stand outbreak model. Data from a recently completed pilot control project of nucleopolyhedrosis virus against Douglas-fir tussock moth in New Mexico was used to demonstrate how the outbreak model functions.

An interactive conversational program for accessing the model and inputting data was reviewed. This program is now being completed by the Computer Sciences Department of U.C. Davis, under contract to FI&DM/MAG.

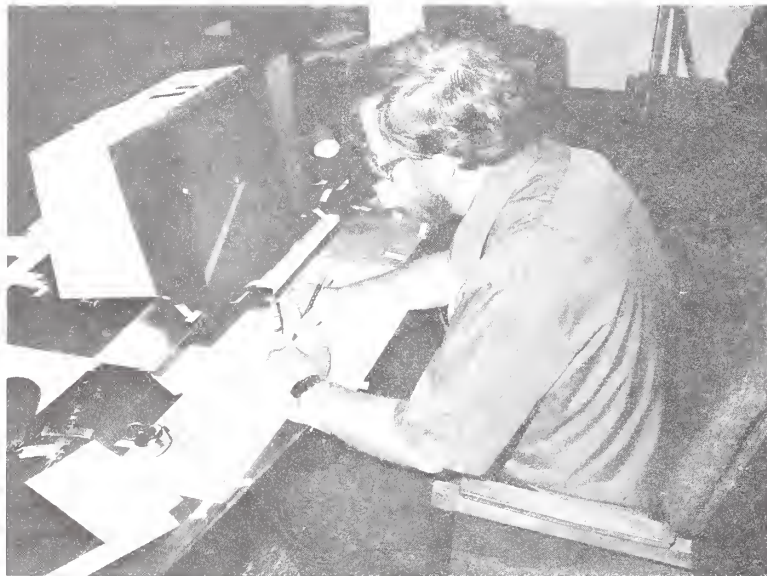
Critiques and informal discussions which took place during the workshop will be of considerable help in making the stand outbreak model and related system documentation and user guides more useful products for forest insect and disease management.

#### HIGH ALTITUDE PHOTOGRAPHY FOR BARK BEETLE SURVEYS

An evaluation of two high altitude camera systems for mapping and stratification of bark beetle infestations over broad areas has been completed. This was a cooperative effort involving the National Aeronautics and Space Administration (NASA), the California Department of Forestry, and several groups within the U.S. Forest Service, including the National Forestry Applications Program, Houston, Texas; Special Mapping Center, Reston, Virginia; FI&DM staffs in Regions 2, 3, and 5; and FI&DM/MAG.

The evaluation was conducted in a 40 x 110-mile test site on the west slopes of the Sierra Nevadas in central California that contains extensive areas of pine forests suffering from drought-related bark beetle infestations. Color infrared photographs at a maximum photo scale of 1:30,000 were obtained

of the site with KA80A optical bar and HR732, 9 x 18" frame cameras, and compared to 9 x 9", 1:7,000 scale color IR photographs and ground surveys. Transfer of data from photo to photo and photo to map, was done with a series of equal-area grid overlays produced by the Special Mapping Center.



The evaluation provided helpful information on planning photo missions using high altitude photography, procedures for enhancing bark beetle mortality during the film duplication process, and quantity production of equal-area grids developed by the Special Mapping Center for use with panoramic format photography.

*Emmett Wilson, FI&DM R-3, interprets small-scale color IR photography using a rear projection microfilm reader.*

Three experienced photo interpreters, using rear projection microfilm readers especially adapted to view the imagery, counted individual discolored crowns and stratified infestation levels. All estimates were made for 40-acre grids common to both formats, and from which 100% ground truth was obtained.

Bark beetle mortality was visible on both the frame and optical bar camera formats, but interpretation accuracy was erratic due to differences in color balance between the two formats and inability of photo interpreters to consistently differentiate between new and old faders. Stratification with the optical bar panoramic format photographs showed promise, but it was judged that photo interpretation would require considerably more time than conventional aerial sketchmapping.

#### FIELD STEREO VIEWERS FOR AERIAL PHOTOGRAPHS

Aerial photography used by FI&DM for evaluation of forest insect and disease damage varies in format size and film type. Most color and color IR film used for forest insect and disease mapping is processed to a positive transparency rather than a print because transparencies are less expensive and afford better resolution. However, there are few ready-made devices for stereoscopic viewing of transparencies in the field, and this may detract from their usefulness. Bill Klein of FI&DM/MAG has designed prototype stereo viewers for 70mm film and for the optical bar panoramic (5 x 50") film. The 70mm viewer is a modification of a field viewer developed during the early 1960's by Bob Aldrich, presently of the



Rocky Mountain Forest and Range Experiment Station. The lightweight, relatively compact viewers are adjustable for 2x and 4x magnification, and are constructed of readily available materials. They use only reflected light for illumination. Plans are available from FI&DM/MAG for either viewer upon request.

*Portable stereoscopic viewer for 70mm transparencies. The film can be viewed intact or by individual frames. The spools and support areas are easily removed. The viewer also can be used for 35mm transparencies.*



*Portable stereoscopic viewer for optical bar panoramic (5 x 50") film. Each frame is left intact by use of the individual rollers.*

## DWARF MISTLETOE LOSS ASSESSMENT

Several Regions were given assistance by FI&DM/MAG in dwarf mistletoe surveys as part of a continuing National effort to obtain estimates of growth loss due to dwarf mistletoes over large areas. Dave Drummond assisted Oscar Dooling (R-1) and Dave Johnson (R-2) in training seasonal survey crews for dwarf mistletoe surveys in eastern Montana and Wyoming. Road survey techniques used to estimate dwarf mistletoe losses on the Medicine Bow National Forest in Wyoming during 1977 were demonstrated to seasonal employees in both Regions. Drummond remained in Wyoming to help Dave Johnson with the survey of lodgepole pine dwarf mistletoe on the Shoshone and Bighorn National Forests. Frank Hawksworth of the Rocky Mountain Forest and Range Experiment Station also contributed time and manpower to this effort. Both Forests were completed in less than a month.

Dave also assisted Jim Hoffman and LeGrande Hobbs (R-4) train crews contracted to survey for dwarf mistletoe loss in the Intermountain Region. Road survey procedures evaluated on the Medicine Bow National Forest in 1977 will also be used in R-4.

## SPRAY ACCOUNTANCY WORKSHOP

Jack Barry of FI&DM/MAG and Professor Norman Akesson of the U.C. Davis Department of Agricultural Engineering cochaired a workshop entitled "Plant Protection and Pesticide Accountancy, Forestry Spray Projects", at Utah State University in Logan on July 25, 1978. The workshop was sponsored by the American Society of Agricultural Engineers.

Spray accountancy is a term used to describe the process of following spray released from aerial or ground spray equipment. The process begins at the spray nozzle and terminates when the spray is finally deposited on a surface or decays through biological, chemical, physical, or other processes. Three workshop panels covered spray sampling, characterizing spray from aircraft, and modeling spray behavior. The workshop provided an opportunity for representatives of both agriculture and forestry to share common problems and accomplishments. Participants emphasized the need to account for spray released in the atmosphere from both the legal and technical viewpoints.

## MARSH TURBO THRUSH EVALUATION COMPLETED

The second phase of a performance evaluation of the Marsh Turbo Thrush for forest spraying has been completed. The Thrush is a turbine-powered fixed-wing agricultural aircraft produced by Marsh Aviation of Mesa, Arizona. This evaluation was conducted near McCall, Idaho, in moderately steep terrain typical of forests which would be treated for western spruce budworm or other forest defoliators.

The evaluation was conducted by Jack Barry, FI&DM/MAG, George Markin, Pacific Southwest Forest and Range Experiment Station, and Jerry Knopf and Max Ollieu of the R-4 FI&DM staff.

This project demonstrated that the Marsh Turbo Thrush is capable of spraying moderate to steep forested areas effectively, efficiently, and safely, with a 400-gallon payload at elevations above 6,000'. Preliminary results of spray deposit monitoring indicate that blocks treated with the Turbo Thrush had relatively consistent deposit and good droplet atomization.



*Marsh Turbo Thrush spraying forests near McCall, Idaho.*



## SPRAY DEPOSIT ASSESSMENT TECHNIQUE EVALUATED

Under sponsorship of the USDA Expanded Douglas-fir Tussock Moth Research and Development Program, Dr. Bohdan Maksymiuk of the Pacific Northwest Forest and Range Experiment Station developed a simple spray deposit assessment system for aqueous sprays. This consists of the adding a small amount of ferric chloride to the tank mix, and coating Kromekote spray deposit cards with a 10% tannic acid solution. Spray droplets containing the ferric chloride react with the tannic acid-treated cards, leaving a purple to black stain.

Lynne Whyte, FI&DM/MAG, in cooperation with Dr. John Dimond of the University of Maine, evaluated this system on a large-scale project of Thuricide 16B, a commercial formulation of the microbial insecticide Bacillus thuringiensis, against eastern spruce budworm in Maine.

Addition of ferric chloride (0.4%) to the Thuricide tank mix caused the solution to turn an inky black color, as if a dye had been added. Tannic acid-treated cards paired with untreated Kromekote cards were placed in the field to sample the deposit. Visible stains were produced on both cards. These cards are now being analyzed by the Quantimet image analyzer in Los Alamos, New Mexico, and will be compared for stain contrast.

Although the addition of ferric chloride colored the spray, its relative ease in handling compared to other dyes used for deposit assessment may prove to be a viable option with or without cards coated with tannic acid.

## FOREST DAMAGE ASSESSMENT--A GLOBAL VIEW

In early July, Bill Ciesla, Group Leader, FI&DM/MAG, participated in an International Symposium on Remote Sensing for Observation and Inventory of Earth Resources and the Endangered Environment. This symposium was sponsored by the International Society of Photogrammetry and the International Union of Forest Research Organizations, and was held in Freiburg, Federal Republic of Germany.

A number of scientists engaged in the assessment of forest damage using color and color IR photography and other sensors attended and presented papers on the subject. In Great Britain, decline of conifer plantations, due to changes in water table resulting from quarrying, is being monitored with aerial photographs. In Sweden, color IR photos at scales of up to 1:60,000 are used to estimate damage caused by the bark beetle, Ips typographus, in spruce forests. West German scientists are predicting decline and mortality of beech due to drought with the aid of color IR photos, and in Australia scientists are mapping the decline of Norfolk Island pine, Araucaria heterophylla, in native stands on Norfolk Island with large-scale color photos.

There were a number of areas of mutual interest and concern among investigators in forest vegetation damage assessment. These were summarized by Dr. Peter A. Murtha of the University of British Columbia in a report of the Working Group on Vegetation Damage in Agriculture and Forestry of Commission VII of ISP. Recommendations of this Working Group called for a stronger



research effort in vegetation damage assessment; a definitive international study on previsual damage detection; more precise definitions of damage and damage classes; coding of forest damage types in chronic vegetation damage situations; increased quality of data presentation through application of statistical tests; and more effective technology transfer at symposia and workshops. These recommendations were echoed by representatives from the agricultural community.

#### SPRAY DEPOSIT ASSESSMENT MANUAL

During the latter part of July, Lynne Whyte, FI&DM/MAG, and Dennis Neil and Galen Trostle, USDA Expanded Douglas-fir Tussock Moth Research and Development Program, reviewed the galley proofs for the Spray Deposit Assessment Manual. Final revisions were made at this time, and the manual is now in press. Copies should be available to prospective users by October 1978.

#### PEOPLE, PAPERS, AND PUBLICATIONS

Susan Aizumi and Ray Bremner are assisting FI&DM/MAG under the college work/study agreement. Both are students at UC Davis. Susan is a senior majoring in landscape architecture, and is assisting Jack Barry and Bill Klein in data compilation, plotting, illustration, and aerial photo interpretation. Ray is a graduate student majoring in linguistics, and is assisting John Wong and Bob Young in general computer programming.

Bill Klein and Bill Ciesla participated in a symposium "Theory and Practice of Mountain Pine Beetle Management in Lodgepole Pine Forests", on the campus of Washington State University, Pullman. Bill Klein presented a paper entitled "Strategies and Methods for Reducing Losses in Lodgepole Pine by the Mountain Pine

Beetle", and Bill Ciesla presented a paper entitled "The Mountain Pine Beetle-Lodgepole Pine Pest Management System: Opportunities for Putting New Knowledge into Practice".

Bill Ciesla presented a paper entitled "Inventory of Bark Beetle in Coniferous Forests with Color and Color IR Photography at the International Symposium on Remote Sensing for Observation and Inventory of Earth Resources and the Endangered Environment, Freiburg, Federal Republic of Germany.

#### PUBLICATIONS

Barry, J.W. and R.B. Ekblad. 1978. Deposition of insecticide drops on coniferous foliage. Transactions, American Society of Agricultural Engineers, 21(3):434-441.

Dumbauld, R.K. 1978. Development of field procedures for estimating mass density on spray deposit cards. Prepared under contract No. 26-3843, USDA Forest Service Equipment Development Center, Missoula, Montana, and FI&DM/MAG, Davis, California.



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